

Integrated Multi-Mode Automation for Trajectory Based Operations, Phase I

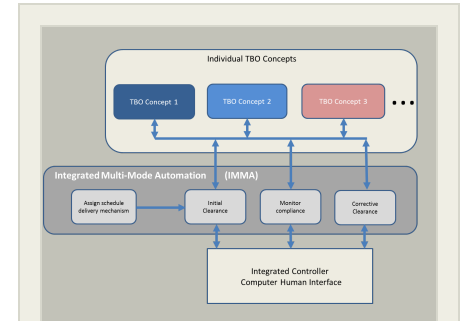
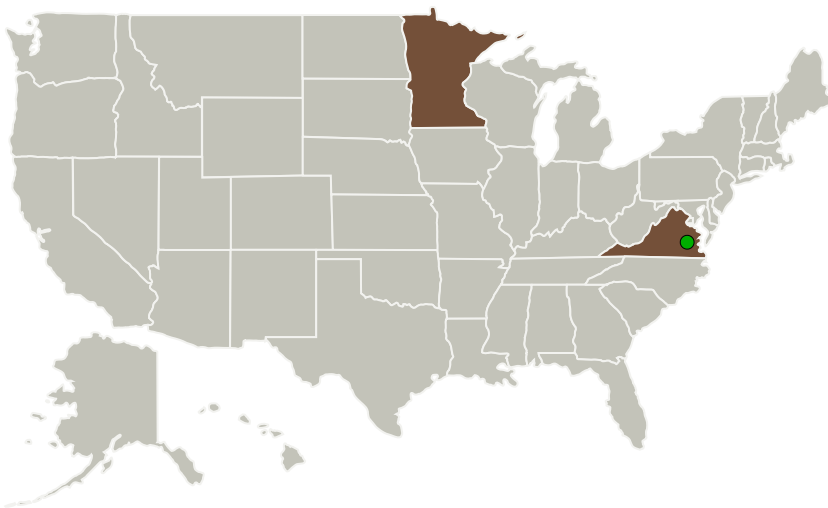
Completed Technology Project (2016 - 2016)



Project Introduction

Air Traffic Management's lack of support for aircraft with different capabilities is a long standing and persistent issue that can limit the ability of the National Airspace System (NAS) to take full advantage of advanced aircraft capabilities. To fully utilize the variety of Trajectory Based Operations (TBO) concepts planned for the NAS, some of which utilize advanced aircraft capabilities for implementing trajectories, an air traffic controller (ATC) must be able to simultaneously support a variety of TBO concepts using different aircraft automation systems to fly the desired trajectory. To accomplish this, the ATC needs automation support to simplify the inherent complexities of using a variety of different TBO concepts and trajectory implementation strategies and provide the controller with the tools needed to execute the desired trajectories, maintain situational awareness at all times, and support off-nominal situations. As depicted in Figure 1, IMMA (Integrated Multi-Mode Automation) provides the automation to simplify the inherent complexities of using multiple TBO concepts by focusing the controller interactions on common core functions (e.g., the initial clearance, compliance monitoring) that all TBO concepts must support. For example, monitoring compliance for an aircraft using speed/path to control delivery time at a metering point is different than monitoring compliance for an aircraft executing Flight Interval Management (FIM) which maintains a time-based spacing interval with another aircraft. Using IMMA, the controller doesn't need to track compliance differently for the two different implementations because the automation accounts for the difference and simply informs him if an aircraft is out of compliance.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Architecture Technology Corporation	Lead Organization	Industry	Eden Prairie, Minnesota
● Langley Research Center(LARC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Minnesota	Virginia

Project Transitions

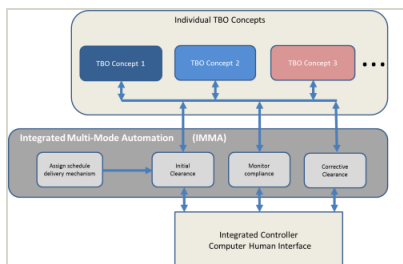
▶ **June 2016:** Project Start

✓ **December 2016:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140380>)

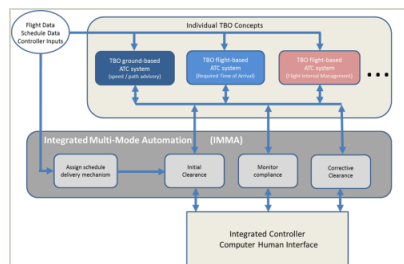
Images



Briefing Chart Image

Integrated Multi-Mode Automation for Trajectory Based Operations, Phase I

(<https://techport.nasa.gov/image/128250>)



Final Summary Chart Image

Integrated Multi-Mode Automation for Trajectory Based Operations, Phase I Project Image

(<https://techport.nasa.gov/image/127944>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Architecture Technology Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

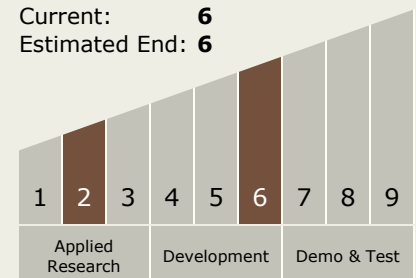
Douglas Sweet

Technology Maturity (TRL)

Start: 2

Current: 6

Estimated End: 6



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.3 Aero Propulsion
 - └ TX01.3.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System